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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/726,948   | 12/02/2003  | Stephen C. Hahn      | SUNMP453            | 5353             |
| 32291  | 7590        | 11/07/2008           | EXAMINER            |                  |
| MARTINE PENILLA & GENCARELLA, LLP<br>710 LAKEWAY DRIVE<br>SUITE 200<br>SUNNYVALE, CA 94085 |             | WAI, ERIC CHARLES    |                     |                  |
|  |             | ART UNIT             |                     | PAPER NUMBER     |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                        |                     |  |
|------------------------------|------------------------|---------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b> | <b>Applicant(s)</b> |  |
|                              | 10/726,948             | HAHN ET AL.         |  |
|                              | <b>Examiner</b>        | <b>Art Unit</b>     |  |
|                              | ERIC C. WAI            | 2195                |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 18 August 2008.  
 2a) This action is **FINAL**.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 9,12,14-23,25 and 36-41 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 9,12,14-23,25 and 36-41 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

|  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ .                                    |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____.   | 6) <input type="checkbox"/> Other: _____ .                        |

## DETAILED ACTION

1. Claims 9, 12, 14-23, 25, and 36-41 are presented for examination.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 9, 12, 14-23, 25, and 38-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Uri ("Workload management-many questions", IT Resouce Forums, 7-10-2002, XP002290900, pp, 1-4, <<http://forums1.itrc.hp.com/service/forums/questionanswer.do?admit+716493758+1091180233157+28353475&threadID+25550>>).

4. Uri was disclosed in IDS dated 06/20/2005.

5. Regarding claim 9, AAPA teaches a computer implemented method comprising: monitoring usage of a computing resource utilized by a workload, the workload includes a plurality of running processes, the plurality of running processes are a subset of all processes that are running in the user space (pg 3 lines 14-16, wherein the request is determined to request more physical memory than is available; col 3 line 22-col 4 line 5, wherein workloads exist in a user space and include child processes);

responsive to exceeding a limit on utilization of said computing resource, decreasing usage of said computing resource by said workload (pg 5 lines 1-9, wherein a given workload is victimized when it exceeds its allocation), said computing resource comprises physical memory (pg 3 lines 14-15) and said decreasing usage of said computing resource comprises paging a portion of said physical memory assigned to said workload out of said physical memory (pg 4 lines 7-13).

6. AAPA does not explicitly teach wherein said monitoring occurs within a user space and the process monitors the user space only. In fact, AAPA teaches the step of monitoring for all resources (i.e. all user spaces) by an operating system.
7. Uri teaches an improvement on existing techniques that is supported by HP-UX 11i. Uri teaches using Memory Resource groups wherein a block of memory is allocated to each workload and a separate memory management subsystem will be created for each workload, i.e. part of that workload (pg 3 paragraph 2). Uri further teaches that if an application is a workload attempts to allocate more memory than it is entitled to, paging will occur despite there being addition memory being available to other workloads (pg 3 paragraph 2).
8. It would have been obvious to one of ordinary skill in the art at the time of the invention that the accessing is performed within the user space. One would be motivated by the desire to make these modifications to AAPA because doing so allows for more fine grained control and allows for resources to be allocated based on business priorities as indicated by Uri (pg 3 paragraph 3).

9. AAPA and Uri do not explicitly teach that said decreasing usage does not halt operation of said workload. However, it would have been obvious to one of ordinary skill in the art to modify AAPA and Uri to teach that decreasing usage does not halt operation. One would be motivated by the desire to increase the efficiency of AAPA by continually executing the workload while performing memory paging.

10. Regarding claim 12, AAPA teaches that said portion of said physical memory comprises a least recently used portion of said physical memory assigned to said workload (pg 4 lines 20-22).

11. Regarding claim 14, AAPA teaches that said decreasing usage is initiated by a process of said workload (pg 5 lines 18-20).

12. Regarding claim 15, AAPA and Uri do not teach that said process that performs said monitoring is not an operating system kernel process.

13. AAPA does teach that operating system kernel processes can be very expensive in terms of computing load on a system as they execute very frequently (pg 5 lines 13-15). It would have been obvious to one of ordinary skill in the art to perform the monitoring by some other process. One would be motivated by the desire to reduce computing load.

14. Regarding claim 16, AAPA teaches a computer implemented method for memory management of a workload comprising:

accessing a list of memory pages assigned to said workload, the workload includes a plurality of running processes, the plurality of running processes are a subset of all processes that are running in the user space (pg 5 lines 11-12 and col 3 line 22-col 4 line 5, wherein workloads exist in a user space and include child processes);

responsive to a request from a first process of said workload for memory which exceeds a predetermined memory limit for said workload, selecting a plurality of memory pages from said list of memory pages, wherein the plurality of memory pages includes least recently used memory pages assigned to the workload (pg 5 lines 11-12 and pg 4 lines 20-22, wherein the memory to be paged out is least recently used); and

initiating a second process within the user space to page out said plurality of memory pages (pg 5 lines 11-13).

15. AAPA does not explicitly teach that the accessing is performed in a user space. However, Uri teaches an improvement on existing techniques that is supported by HP-UX 11i. Uri teaches using Memory Resource groups wherein a block of memory is allocated to each workload and a separate memory management subsystem will be created for each workload, i.e. part of that workload (pg 3 paragraph 2). Uri further teaches that if an application is a workload attempts to allocate more memory than it is entitled to, paging will occur despite there being addition memory being available to other workloads (pg 3 paragraph 2).

16. It would have been obvious to one of ordinary skill in the art at the time of the invention that the accessing is performed within the user space. One would be motivated by the desire to make these modifications to AAPA because doing so allows for more fine grained control and allows for resources to be allocated based on business priorities as indicated by Uri (pg 3 paragraph 3).

17. AAPA and Uri do not explicitly teach that at least a portion of said workload continues to operate subsequent to said initiating. However, it would have been obvious to one of ordinary skill in the art to modify AAPA and Uri to teach that the workload continues to operate. One would be motivated by the desire to increase the efficiency of AAPA by continually executing the workload while performing memory paging.

18. Regarding claim 17, AAPA teaches that accessing, selecting and initiating are performed by said second process within said workload (pg 5 lines 11-20, wherein the steps are performed by another process).

19. Regarding claim 18-19, AAPA and Uri do not teach that said second process is not an operating system kernel process or that said second process is loaded into a user space.

20. AAPA does teach that operating system kernel processes can be very expensive in terms of computing load on a system as they execute very frequently (pg 5 lines 13-15). It would have been obvious to one of ordinary skill in the art to perform the

monitoring by some other process. One would be motivated by the desire to reduce computing load.

21. Regarding claims 20-21, AAPA teaches that said plurality of memory pages comprises memory pages that are least recently used by said workload (pg 4 lines 20-23).

22. Regarding claim 22, AAPA and Uri do not explicitly teach that said page out of said plurality of least recently used memory pages reduces a number of memory pages assigned to said workload to below said memory limit.

23. However, it would have been obvious to one of ordinary skill in the art at the time of the invention, that if the page out was performed in response to the physical requirements being exceeded, that the course of action would remedy the excessive use of resources.

24. Regarding claim 23, AAPA and Uri do not teach that said plurality of least recently used memory pages comprises the minimum number of memory pages to reduce said number of memory pages assigned to said workload below said memory limit.

25. However, it would have been obvious to one of ordinary skill in the art at the time of the invention, that if the page out was performed in response to the physical

requirements being exceeded, that the course of action would remedy the excessive use of resources.

26. Regarding claim 25, AAPA and Uri do not teach that said initiating is not performed by an operating system kernel process.

27. AAPA does teach that operating system kernel processes can be very expensive in terms of computing load on a system as they execute very frequently (pg 5 lines 13-15). It would have been obvious to one of ordinary skill in the art to perform the monitoring by some other process. One would be motivated by the desire to reduce computing load.

28. Regarding claim 38, AAPA teaches a computer implemented method of managing computer resources over a plurality of workloads, said method comprising:  
for each workload of said plurality of workloads, monitoring respective workload resource usage against a respective allotment of each workload (pg 5 lines 11-12);  
determining a range of computer resources to page out for each workload whose resource usage exceeds its respective allotment (pg 5 lines 11-12); and  
initiating a paging out operation of said range of computer resources and wherein said monitoring (pg 5 lines 11-13),

wherein each of the plurality of workloads exists within a user space and includes a plurality of running processes, the plurality of running processes are a subset of all processes that are running in the user space (pg 5 lines 11-12 and col 3 line 22- col 4

line 5, wherein workloads exist in a user space and include child processes), and paging out said range of computer resources (pg 4 lines 7-13).

29. AAPA does not explicitly teach wherein said determining and initiating occur within a user space. In fact, AAPA teaches the step of selecting for all resources (i.e. all user spaces).

30. Uri teaches an improvement on existing techniques that is supported by HP-UX 11i. Uri teaches using Memory Resource groups wherein a block of memory is allocated to each workload and a separate memory management subsystem will be created for each workload, i.e. part of that workload (pg 3 paragraph 2). Uri further teaches that if an application is a workload attempts to allocate more memory than it is entitled to, paging will occur despite there being addition memory being available to other workloads (pg 3 paragraph 2).

31. It would have been obvious to one of ordinary skill in the art at the time of the invention that the determining and initiating occur within a user space. One would be motivated by the desire to make these modifications to AAPA because doing so allows for more fine grained control and allows for resources to be allocated based on business priorities as indicated by Uri (pg 3 paragraph 3).

32. AAPA and Uri do not explicitly teach that each workload whose resource usage exceeds its respective allotment remains partially operable during said paging out of its respective range of computer resource. However, it would have been obvious to one of ordinary skill in the art to modify AAPA and Uri to teach that the workload continues to

operate. One would be motivated by the desire to increase the efficiency of AAPA by continually executing the workload while performing memory paging.

33. Regarding claim 39, AAPA teaches that determining comprises determining least recently used pages for each workload whose resource usage exceeds its respective allotment (pg 5 lines 11-13).

34. Regarding claim 40, AAPA teaches that the process is situated within a workload of said plurality of workloads (pg 3 lines 22-24).

35. Claims 36-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanenbaum (Modern Operating Systems, 2<sup>nd</sup> edition, 2001, Prentice Hall Intl, New Jersey) in view of Applicant's Admitted Prior Art (AAPA).

36. Tanenbaum was disclosed in IDS dated 06/20/2005.

37. Regarding claim 36, Tanenbaum teaches a computer implemented method comprising:

accessing memory usage for a workload and examining page usage for each process of said workload (pg 234, “4.6.1 Local versus Global Allocation Policies”, paragraphs 2-3, wherein the algorithm tries to find the least recently used page for all the processes);

aggregating usage of said each process to determine an aggregate usage for said workload (wherein it is inherent that a workload comprises many processes);

determining least recently used pages based on accessed bits associated with said workload (pg 235, Fig 4-28, wherein it is inherent that bits are set to indicate least recently used pages).

38. Tanenbaum does not teach performing the determining step based on whether the aggregate usage exceeds said memory utilization limit for said workload and supplying a range of least recently used pages in a system call to an operating system kernel for evicting said range of least recently used pages to reduce resource usage by said workload; and retaining at least partial operation of said workload during said page evicting, wherein the workload exists within a user space and includes a plurality of running processes, the plurality of running processes are a subset of all processes that are running in the user space.

39. AAPA teaches paging out memory in response to workloads exceeding their respective allotments whereby an operating system kernel process will evict selected pages (pg 5 lines 11-20) and that the workload exists within a user space and includes a plurality of running processes, the plurality of running processes are a subset of all processes that are running in the user space (pg 5 lines 11-12 and col 3 line 22- col 4 line 5, wherein workloads exist in a user space and include child processes)

40. It would have been obvious to one of ordinary skill in the art at the time of the invention to perform the determination in response to an aggregate usage exceeding

the memory utilization limit. One would be motivated by the desire to ensure that overall memory usage does not exceed the amount that is physically available.

41. AAPA and Uri do not explicitly teach that the at least partial operation does not stop said workload. However, it would have been obvious to one of ordinary skill in the art to modify AAPA and Uri to teach that the workload continues to operate. One would be motivated by the desire to increase the efficiency of AAPA by continually executing the workload while performing memory paging.

42. Regarding claim 37, AAPA teaches that said determining and said supplying occur in a plurality of user space processes (pg 3 line 24 to pg 4 line 1, wherein multiple user spaces can exist in a system).

### ***Response to Arguments***

43. Applicant's arguments filed 08/18/2008 have been fully considered but they are not persuasive.

44. Applicant argues on pg 7:

"That is, the HP technology utilizes a stop signal to arrest a process when it exceeds its memory limit, and it allows general kernel memory management to move the process's memory from core to disk, and allow other processes the use of the core memory. Once the memory threshold has dropped, a continue signal allows the process

to resume, with requests for memory being honored, and the data moved back from disk to core on an as-needed basis. This mechanism means the process does not continue during periods when it has exceeded its memory limit. The claimed invention does not suffer from these drawbacks, as victim process are not required to stop, but instead pages are marked as movable to swap in proportion to its exceeding of the limit. As claimed, decreasing usage does not halt operation of said workload."

45. Applicant's arguments amount to a general allegation that the claims define a patentable invention over the prior art. However, there is no showing in the prior art of record that indicates that HP technology operates this way. Furthermore, Applicant has not indicated the source of this information, and the mere assertion does not render it as fact.

### ***Conclusion***

46. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric C. Wai whose telephone number is 571-270-1012. The examiner can normally be reached on Mon-Thurs, 9am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng - Ai An can be reached on 571-272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Meng-Ai An/  
Supervisory Patent Examiner, Art Unit 2195

/Eric C Wai/  
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